

The Marriners guide.

Set forth in forme of a dia-

logue, wherein the vse of the plaine Sea

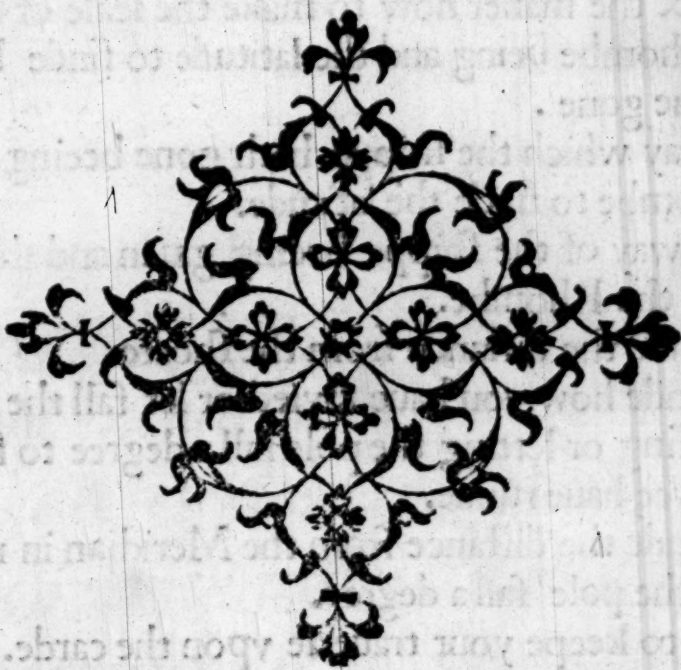
Card is briefly and plainly deliuc-

red, to the commoditie of all such

as haue delight in

Nauigation.

Written by Thomas Hood.



¶ The contents of the booke are

set forth in the page

following.

Ignori nulla cupido.

¶ Imprinted at London by Thomas Este,
for Thomas Wight.

1596.

The contents of this booke.

- 1 What things are especially to bee noted in the Sea card.
- 2 Two places being assigned to finde how they beare one from an other diuers waies.
- 3 From a point giuen in the carde to drawe a line paralell to any point of the compasse.
- 4 To finde the latitude of any place assigned in the Card.
- 5 To finde how many minutes are contained in any part of a degree of latitude described in the carde.
- 6 To finde the distance of any 2 places assigned in y Card.
- 7 The comparing of the English and Spanish leagues together, & the maner how to make the scale of leagues.
- 8 The Rhombe being and the latitude to finde how farre you haue gone .
- 9 The way which the shippe hath gone beeing giuen, & the Rhombe to finde the latitude.
- 10 The way of the shippe beeing giuen and the latitude to finde the Rhombe.
- 11 To finde the distance from the shoare.
- 12 To finde how you haue rayfed or let fall the pole.
- 13 In rayfing or letting the pole fall a degree to finde how many wee haue runne.
- 14 To finde the distance from the Meridian in rayfing or letting the pole fall a degree.
- 15 How to keepe your trauerse vpon the carde.
- 16 How to keepe your trauerse vpon the Carde of a small pricke as well as if it were of a great pricke.
- 17 How to keepe your trauerse vpon the carde though the land lie verie nigh the edge thereof.

TO THE HONO-
rable Sir Iohn Bur-
rowes Knight.



I may seeme (Honorable Sir) a bold attempt, that vppon so small acquaintance I should presume to dedicate this work vnto you: but the cause that moueth mee so to doe, being accordingly waighed, wilbe (as I hope) a sufficient excuse for my presumption. The worke it self concerneth the vse of that, which is most necessarie in Nauigation, to the which you beare an Honorable regard. The desire of knowledge hath moued you to beare mee good will: I my selfe haue alwaies wished well to those that imploy their mindes to nauigation, & finding proceeding from your

A. ii.

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The Epistle.

own self a fauorable inclinatio towards mee, I could not but expresse a dutifull signe of a minde alwaies ready to do you what seruice or pleasure my small habilitie will afford, the which signe as I suppose could not more conueniently bee deliuered then in the dedication of this worke: which if it shall please you pardoning my boldnesse, so to enterpret, as it is ment, and honorably to protect it against my ill willers, I shalbee ready to vndertake a farther matter for my countries good, and to pray for your happie succeſſe in all your affaires.

Yours at your Honorable

commaund T. Hood.

To the industrious Saylors health and prosperitie



Entlemen Saylors, and what soeuer else you are that trauaile by Sea, for your sake I haue vndertaken this paines. I haue had to doe a long time with diuers of your profession both for the making of Sea Cardes, and also for instructing them in mathematicall matters beeloning to Nauigation. Amongst whome I haue found many willing to learne, and by that meanes had an insight into their wants. I found certaine defects in pricking and vsing of the Card, & therefore I haue written this little dialogue concerning the vse of the same, which if you please to peruse at your leasure, I hope you shall finde that therein, which shall be profitable to the ignorant, and not vnpleasant to the skilfull, howsoeuer it shalbe either pleasant, or profitable, if you vouchsafe to take it in good part, it will bee a meanes to moue mee, to a farther labour for your commoditie.

Yours Thomas Hood.



To the Indulgent Sponsors

Health and Prosperity

Kindness Sponsors and what follows the rest
we are to thank by Sea for your sake

C. H. Hine and his family and what follows the rest
does not know what it is to be a sponsor

tion and what follows the rest of the world
also to thank for their kindness and what follows the rest

in the year of the Lord 1800 and what follows the rest
and what follows the rest of the world

which if you desire to make your friends
shall think that they are not to be

neglected and what follows the rest of the world
shall think that they are not to be

neglected and what follows the rest of the world
shall think that they are not to be

Yours Truly
J. H. Hine



The vse of the common Sea Card, 4

written in forme of a dialogue:

M. Now in good sooth Philomathes welcome, you are the last man whom I thought off, and I wished for, to the intent that I might haue a word or two with you, concerning the commoditie which your Mathematicall Studies haue afforded you, in matters of Navigation.

P. Sir I thanke you most hartelie for your good remembrance, and I must needs confesse, that there was no man, with whome I more desired to speake then with you, partly that I might thankfully acknowledge the profit reaped by your instruction, & partlie that I might request of you a farther matter, which being obtained, I shall thinke it no small increase of that heape of benefits, which many times I haue receaued at your hands.

M. Speake on Philomathes what may it be which you desire, you may commaund me in any reasonable request.

P. Being at sea we were dyuen to and froe, as winde and weather serued vs, hauing sometimes the light of the Sunne, sometimes of the starres, & sometimes being de- priued of them both for a long season: yet notwithstanding the master of our shippe and his mate, with diuers other of the company, had certaine plats, as they tearmed them (such as you commonly make, though I neuer greatly had regard to their vse) wherein they could keepe a reckoning of the way, which they had made, and set downe a picke representing the place wherein they were, and performe many other pretty conclusions. Wee thought it was most pleasant to see them do it, though I were much grieved with mine owne ignorance in that matter: yet hauing an hope by your meanes to attaine to the knowledge thereof, I made such hast after mine arriuall, as
my

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my businesse would asoꝛd to come vnto you, that I might bee instructed in the vse of the foresaid Card.

M. Oh Philomathes, that were a dangerous matter for me to vndertake, partly because herein I might seeme to doe, as Phormio the Philosopher dyd, who though hee had neuer seene any camp, dared notwithstanding to discourse of warlike affaires before Annibal, and partly because I should seeme to iustifie this kinde of proiection of the plaine card, which I cannot safely defend, because it is erroneous.

P. What, is it faultie? I pray you by what reason doe you proue your saying: they haue bene vsed, and are yet retained by most excellent Nauigators of our time.

M. I know it well Philomathes, that they are retained by many excellent men, but yet with this dayly wish, that the same might bee amended, and that ther might a better proiection be made: but hereby you may perceue the error of these plats, in that the Meridians being parallell, the degrees of longitude and latitude which are in them haue not in any respect that simmetrie & proportion one to another, which the Globe requireth: for in this plain description of the Card, the degrees of longitude, & latitude in each seuerall parallell are of one quantitie, and y^e Meridians meeting with the parallels, make perfect squares, which is contrary to y^e nature of the Globe, wherein y^e Meridians tending to one pole, either North, or Southward, the degrees of longitude in each parallell betwene the equator & the pole, war shorter and shorter, according as the parallels come neerer and neerer to the pole, & the meridians meeting with y^e parallels make vnperfect squares, which the Geometricians call Trapezia.

P. In deede I remember that the sayloꝛs many times haue acknowledged some such kinde of fault, & by supposition imagining that two ships comming from the equator, and being two hundred leagues a sunder, should bend their

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their course Northward, vnder the Meridian, vntil they came to the 60 paralell, by the plaine card they cannot be found to be lesse then 200 leagues distant one from an other, which is vnpossible, considering that the 60 paralell, is but halfe the content of the equator, and therefore those two Shippes should be but halfe that distance one from an other, which they were distant vnder the equator, namely, 100 leagues. Moreover I haue heard them acknowledge this, that there are three things which they can very hardly bring togeather vpon their plat, without committing an error in y one of them, that is to say, the point of the compasse, vpon which they saile the distance, and the latitude: besides the land is greatly distorted from his natural forme, so that it is nothing like vnto that which we see described vpon the Globe: but notwithstanding all these things alleaged, either by you or mee, let my request preuaile, which is, y you will vouchsafe to teach mee how to vse the plaine card.

M. If you will needes haue mee fulfill your desire Philomathes, I will doe what I can to satisfie you, crauing notwithstanding, that this my deede bee not preiudiciall to any other mans, whose experience in Hydographicall matters is more then mine: when his discourse cometh forth, let it bee accepted as it shall deserue, in the meane season, let this serue the tourne.

P. Goe to then, first let vs consider what things are described in the card, secondly, what vse they haue.

M. The things described in the card, and especially to be noted are these. First the Hydographicall description of the sea coast. Secondly the lines drawen ouer the face of the whole card, and concurring one with an other iointly together in sondry places of y card in one point, which I terme the center of the sic, for instruction sake, following y comon phrase of speach. These lines are

What things
are especially
to be regarded
in the sea card

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commonly called 8 points of the compasse, but in teaching because I would gladly auoyde the tediousnesse of that name, therfore hereafter I will cal them Rhombes, following the Spanish appellation, who hath so intituled them in (that vpon the plaine Carde especiallie) they represent after a sort the Geometricall figure, which is called a Rhombe. The names of these Rhombes are particularlie expessed by certaine letters, both in the toppe, and the bottome of the Carde, the which letters haue this signification

N.	} Signifieth }	North.
N.B.E.		North and by East.
N.N.E.		North north East.
N.E.B.N.		North East and by north.
N.E.		North East.
N.E.B.E.		North east and by East.
E.N.E.		East north east.
E.B.N.		East and by north.
E.		East.
E.B.S.		East and by South.
E.S.E.		East South East.
S.E.B.E.		South East and by East.
S.E.		South east.
S.E.B.S.		South East and by South.
S.S.E.		South south East.
S.B.E.		South and by East.
S.		South.
S.B.W.	}	South and by west.
S.S.W.		South south west.
S.W.B.S.		South west and by south.
S.W.		South west.
S.W.B.W.		South west and by west.
W.S.W.		West south west.
		W.B.S.

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W.B.S.	} Signifieth.	West and by South.
W.		West.
W.B.N.		West and by North.
W.N.W.		West north west.
N.W.B.W.		North west and by west.
N.W.		North west.
N.W.B.N.		North west and by north.
N.N.W.		North north west.
N.B.W.		North and by west.

And here I must tell you this Philomathes, that for so much as the maine vse of the Card dependeth vpon these lines, therefore you must endeouour your selfe toth and naile, to be ready not onely in the names, that you may say your compasse both forward and backward, but also in the lines, that seing of any line you may be ready to name it, and the line being named, you must be redy presently to finde it vpon the card.

The third thing to bee noted, are the degrées of Latitude, contained betwene two small lines on the left hand of the card, & hauing their numbers adioyned vnto them seuerally. The fourth & last thing is the scale of leagues both English and Spanish, set on the right hand of the card. These are the chæfest things to be obserued: as for the cyphers set at the vpper and neither end of the card round about the flies, they shalbe expressed hereafter in their place, because they are not essentiall matters touching the substance of the card, but voluntarily set down for remembrance sake.

P. Well then I pray you let mee vnderstand the vse of the forenamed things.

M. The end of the Hydrographicall description of the coast is to lay forth vnto vs, not onely the Baies, Capes, Angles, Ilands, Mountaines, Ports, Points, and Ryuers, but also the daungers of the sea, so farre forth as

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they may conueniently bee deliuered to the eye : in the which you are to note, that b signifieth a Baie, c a cape: a an angle, i an Iland : yas Ilands : m a mountaine, po. a port : pa. a point, r, a riuer, x a rocke, & a rocke with other great daunger, if it haue pyckes, the lands are expressed by small pyckes.

P. There is no difficultie in vnderstanding of this, what say you of the lines which you call the Rhombes.

Propo:

M. They haue this vse to direct or sette our course from place to place, so y^e vpon them dependeth y^e answer vnto this proposition: Two places being assigned to finde y^e Rhombe, y^e is to say, the point of the compasse vpon which they lie, & how we are to direct our course from the one vnto y^e other. The which proposition is to be performed 2 seuerall waies generallie or perticulerlie. The generall way is that which teacheth vs to finde out the Rhombe howsoeuer the places beare one from an other, whether they lie iust vpon a Rhombe as preciselie North, North East, or South south West, or North & by East &c : or whether they bend somewhat more towards y^e east, west north, or south, as when they lie north west, & halfe a point to the westward, or south east, & halfe a point or a quarter, or three quarters to the east ward, &c. The which way to finde the Rhombe generally is in this maner. Having found out in your Plat the 2 places assigned which I suppose to be M. N. Lay a straight ruler vpon them (if you please you may draw a line with a fine blacke lead from the one place vnto the other, extending it at large ouer the carde, both aboue and beneath the 2 places assigned, but it is needelesse for the laying downe of the ruler is as much as the drawing of the line) marke where the said ruler, or line if it bee drawn cutteth any one Rhombe (which or whensoever it is) of North and South as for example the line M. N. cutteth the middlemost

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Alemost Rhombe of North and South in the point S.
 Then take the Semidiameter of the Circle. A B C D.
 namely the line A E. and according to that Semidia-
 meter vppon the point. S. describe an arcke or peece of
 a Circle the shortest that may bee drawn betwene the
 Rhombe of North and South, and the line running
 betwene the two places in such manner as you see the
 arcke. T V. Take the distaunce of the saide arcke,
 T V. and counte it from the point B or the point D. ei-
 ther to the right hand, or to the left, according as the
 situation of the line drawn betwene the two places
 assigned shall best aduise you, (that is to say, if your
 course lie Southward and to the East, then count the
 distaunce from D. toward C. if you runne Southward,
 and to the West, count the distaunce from D. towards
 A. But if you sette Sayle to the Northward
 Easterlie, then reckon the saide distaunce from B. to-
 ward C. if your course bee betwene the North and the
 West, let the distaunce bee accounted from B. towarde
 A) the Rhombe which shalbe next vnto the foote of your
 Compasse, is it vppon which the two places assigned
 do lie, and according vnto that Rhombe must your course
 be directed, if the winde will giue you leaue. As in this
 example, counting the arcke T V. from D. towarde A.
 I finde the foote of my compasse to light preciselie vppon
 the Rhombe of South south West, and therefore I
 say, y that is the Rhombe, vppon which M. and N. doe
 lie, and according to that point of the Compasse must
 my course be kept from M. to N.

P. But put case that the foote of my Compasse doth
 not light preciselie vppon any one Rhombe, but betwene
 two of them, how shall I then say the places are situated
 and lie one from an other.

M. In this case you must denominate y positio or lying of
 y 2 places according to y Rhombe, which shalbe found to be

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next

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next vnto the foote of the compasses, adding these wordes, and a quarter, halfe, or thre quarters of a point more to the South, North, East, or West, as you shall see occasion. This is the generall way to finde the Rhombe.

P. But as I remember I sawe saylers work otherwise.

M. You say true, for in searching out the Rhombe, or point of y^e compasse, they set y^e one foote of the compasses on the place from whence they put, and aiming, or getting how the place vnto which they goe may beare from it, they extend y^e foote of their compasses accordingly as the Rhombe requireth, at the which they gessed, directing the foote of their compasses vpon the said Rhombe from the place of their departure vntill they come vnto y^e place vnto which they entend to goe: But trust mee Philomathes ther is no way more readie & certaine, generally, the y^e which I haue set down, for if it be followed precisely according to my prescription, you cannot misse y^e bredth of an haire in finding out any Rhombe betwene 2 places assigned, because it bringeth forth the iust angle of position according the description of the Card.

P. I hope practise will bring readinesse: What is the particuler way to finde out the Rhombe.

M. The particuler way is that which requireth a certaine position, or situation of the 2 places assigned, & it is twofold, hauing a double worke according as y^e 2 places are diuersely situated from, or neare vnto y^e Meridian. For this you may easelie perceiue by your Carde, & by common sence also, that sometimes the assigned place, to which you bende your course, may bee verie neare vnto the Meridian of the place, from whence you departe, sometimes the place to the which you goe, may be far off from the Meridian from whence you set saile, and neare vnto the East or West point of the compasse: wherbypon ther ariseth a twofold worke in this manner to bee perfozmed. If the places lie neare to the Meridian one of
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an other, (namely if they lie not more then North east, or North west, South east, or South west, one from an other) lay your ruler vpon them both, and mark wher it cutteth any 2. of the parallel Rhombes, which runne east and west.

P. Doth it not make any matter which two parallels they be, which the ruler cutteth, whether they be in the middest, at the bottome, or at the top of the card.

M. It is neither here nor there, which parallels you make choise of in the performing of this conclusion, but it is best to choise those two parallels, which are nighest together, be they whersoever (so that the ruler doth touch them both) for sauing of your labour in extending of your compasses, as for example: if that I were to goe from M. vnto N. I lay my ruler vpon them both, & finde that it cutteth all the parallel Rhombes of east and west, from N. downward in the points, A. B. C. D. and E. but I make choise onely of the two neithermost parallels, and with my compasses I take the distance betwene the 2 points D. and E. wherein the ruler cutteth the parallels.

P. When this distance is taken, what is then to be done, and how must I proceed to finde the Rhombe?

M. Your Compasses being kept at their extent, make choise also of the centre of some one flie, being in either of the two foresaid parallels. (as for example,) I make choise of the center E. which is in the vppermost of the two parallels in that center E. I set y^e one foote of the compasses, and tourne the other foote downward to y^e other parallel, setting it precisely in y^e same: The Rhombe, vpon which y^e foote of y^e compasses doth fall, is that, wher on the two places assigned doe beare one from an other, as for example, I finde the foote of the compasses to light iust vpon the Rhombe of South South west, wherefore I conclude that to be y^e point of the compasse vpon which N. beareth from M. and according to that (so nere as
may

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may be) must I shape my course.

P. Yet here ariseth one doubt, which is this, when I set the one foote of my compasses in the one parallel, and turne the other foote toward the other parallel, is it not materiall which way I turne the said other foote, either to the right, or to the left hand?

M. Yes, it is greatly to be regarded, and this must bee your general rule, namely that as your ruler lieth so must your compasses be situated, that is to saie, the right line supposed to be drawn from the one foote of the compasses vnto the other, must be parallell to the side of the ruler: so shall you be sure to finde out the Rhombe, because this is a principle, as it were, concerning the Rhombes described in the plat, that all lines either actually, or by imagination equidistant therein one vnto an other, haue one and the same denomination.

P. And as I gesse, I must obserue that also in that rule, which you taught mee before, namely, that if the foote of my compasses being situated orderly, shall not precisely touch any of the Rhombes, than am I to entitle the position of the two places according to that Rhombe which shalbe next vnto the foote of my compasses, adding these words and a little more to the Southward, or Northward, &c. As the fall of the compasses shall best aduise mee.

M. You say well: Thus much concerning the first particular way of searching out the Rhombe, when the two places assigned lie neare to one an others Meridian. But if it shall so fall out, that the two places assigned in your plat lie not neare vnto one an others meridian, but beare almost East and west one from an other, then can you not vse the former way conveniently, because either the compasses will not reach the two parallels of East & West, as they dyd before, or else their extent wilbe very great, and the intercection of the ruler and the parallels wilbe so oblique, that you cannot iustly discerne where to pitch

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pitch the foote of your compasses. Therefore in this case you shall work thus. Lay your ruler vpon the 2 places assigned, and mark where it cutteth any two Rhombes of North and South (which hereafter for instruction sake I will call Meridians, because in deede they are so) As for example, I lay the ruler vpon O. and P. and finde it to cut all the Meridians from P. toward my left hand, but for the performance of this conclusion, I make choise onely of those two which are next vnto P. toward the sayde hande, the which Meridians are cut by the ruler in the points F. and G. Take the distaunce of these 2 points, & setting the one foote of your Compasses in any center of any lie, which is in either of the Meridians (as for example, set it in the center W) turne the other foote of your compasses about, vntill the other foote touch the other meridian (prouided alwaies that the situation of your compasses be like vnto the situation of the ruler) the Rhombe vpon which the said foote of the compasses doth either precisely light or come nearest vnto, is it, which giueth the denomination to y^e position of the 2 places assigned whereby in this example I say that P. beareth from O. west & by South, & O lieth from P. East and by North. Thus much briefly for finding out the Rhombe either generally or particularly.

P. It followeth therefore now to speak of the degrees of Latitude.

M. You say trew Philomathes, so our method doth require, that we should proceed, but for so much as mine experience in pricking of the card is more the yours, I think it not amisse to teach you a conclusion (which is the conuerse of y^e which went befoze) because it is of great vse: you haue learned how to finde out the Rhombe y^e therby you may direct your course frō place to place, now learne this also From a point assigned in the card whersoever, to draw a line parallel to any Rhombe assigned. But be

2 Proposition.

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foze I procéde I must aduise ycu of this, that the word Rhombe in this proposition must be largely taken, as it was befoze, not onely for any line of direction vsually expressed vpon the carde, but also for any line by imagination conceaued to bee drawen betwene them, as that which is drawen South West and halfe, or a quarter, or thre quarters of a point to the Westward, and such like, wherevpon wee say y this conclusion may be wrought also either generally or particularly. For this you know y sometimes we may name a Rhombe precisely & simply, without any addition, as when I say that from y point O I would haue a Rhombe drawen west & by south directly: sometimes we name a Rhombe with this addition a quarter, halfe, or thre quarters of a point moze toward such or such a coast, as when I say y from the point I. I would haue a Rhombe drawen south east & by south & half a point moze vnto the eastward: How so euer the question is propounded, you shall generally absolue it thus. From the point assigned (as for example, from I.) draw an infinite right line (that is to say, a line long enough to serue your turne) parallell to y next meridian line (if the point assigned be not in y meridian, for the this labour is saued) Afterwards with your compasses take the length of y semidiameter E D. which is at y nether end of the card toward y right hand, according to that semidiameter vpon the point geuen, namely vpon I. describe an arcke or pece of a circle K L.

P. But where or on which side of y line shall I describe the said arck, shall I describe it aboue, or beneath y point assigned, againe shall I describe it on the right or on the left hand?

M. You must describe y foresaid arck according as your course requireth, y is to say, if your course lie to the southward, easterly, or full east, describe the arcke beneath the center or assigned point toward the right hande, if your
course

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course lye southward, westerly, or full west, describe it beneath the center or assigned point toward the left hand. If your course lye northward, easterly, or full east, describe the foresaide arcke aboue the assigned point toward the right, but if it be northward westerly, or full West, describe it toward the left hand: as in the example propounded because from the point I. it is required that I should draw a line South East and by South, and halfe a point more to the eastward, therefore the foresayde arcke K L. is described beneath the center or assigned point toward the right hand.

P. Hetherto I vnderstand you: but let vs procede, when as vpon the center or assigned point I haue described an arcke according as my course directeth me, what must I then doe?

M. If your course lie Northward set the one foote of your compasses in the point B. which is on your right hand toward the bottome of the card, but if your course lie Southward, set it in the point D. and extend the other foote vnto so much of the circumference, as is contained betwene B. or D. and the Rhombe assigned, as in the example propounded, I extend my compasses from D. to the Rhombe of South east and by South, and halfe a point more vnto the Eastwarde, that is to say, I take the distance betwene D. and X. and then setting the one foot of my compasses thus extented in the beginning of the arke, which I drew before, namely in the point K. with the other foote I make a marke in the same arke in the point L. The right line drawen from I. (which is the point giuen) vnto L. is the line desired parallell to the Rhombe of South East and by South, and halfe a point more vnto the Eastwarde, for it maketh the same angle with the meridian I. K. which the line E. X. maketh with the meridian E. D.

C.ii.

This

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This is the generall and most certaine way of drawing the Rhombe from a point giuen. But if it so fall out that the Rhombe, which is to be drawn from the point assigned, be simply named without addition of halfe a point more or lesse toward such, or such a coast, then you shall describe y^e said Rhombe thus. Among all the lines described ouer the face of the carde, seeke out (so neare vnto the assigned point as may be) such a line as beareth the same denomination with the desired Rhombe: as for example, if from the point Q. you were enioyned to draw a Rhombe southwest and by west, seeke out a line that may beare that denomination, (the which as it falleth out in this card is that line that cometh from the westermost part of England to the yland of Faial among the Acores, namely the line y.Z. Then setting the one foote of your compasses in Z, that is, in the assigned point put forth, or pull in the other foote so long, vntill you may but touch the line y.Z. Afterwards set the one foote of the compasses in some other place of the line y.Z. either to the North or Southwarde as the desired Rhombe shall best aduise you, as for example in the point Z. and with the other foote make an arcke of a Circle, on that same side of the line, vpon which the assigned point is, namely the arcke R. the right line drawn from Q. the point assigned to the top of the saide arcke is parallel to the Rhombe desired. Thus much concerning the finding out of the Rhombe, and the manner how to draw a line parallel vnto any of them from a point assigned. Let vs now procede Philomathes to the vse of the degrees which consisteth in this especiallie, any place being assigned in the carde to finde the latitude thereof.

3 Propo.

P. By the Latitude you meane the distaunce of any place from the Equinotiall either to the North or Southward, according as it is commonly taken in Geographi-
call

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call matters.

M. I doe so vnderstand it, and hère you must note also, that for so much as the Latitude of any place, and the height of the Pole at the same place are all one in number, though they be counted in severall maners & from dyuers places, (for the latitude as you know is counted from the equator toward the Zenith, or vertuall point in the heauen right imminent ouer the place wherein we are, but the height, eleuation, or altitude of the North point is counted from the Horizon to the Pole it selfe) therefore they are vsually confounded, and we say that by the carde we may finde in what height any place is, or what altitude or eleuation the Pole hath aboue the Horizon of any place expessed in the Carde: whereas in truth the Degrés commonly expessed in the Carde are not the Degrés of the eleuation of the Pole, but the Degrés of Latitude. The which Latitude of any place assigned is found out thus.

Set the one foote of your compasses in the place assigned (as for example in the point O.) and with the other foote take the shortest distaunce from thence to the next parallell of East and West, either aboue or beneath it, so that your Compasses being stretcht forth, you may but touch the parallell. The running with your eye along that parallell toward the Scale of Latitude, marke where the parallell cutteth the said Scale, there set the one foote of your Compasses, and turne the other either vpward or downward in the same Scale, as the place assigned shall best aduise you, the Degree vppon which the foote of the Compasses lighteth, expesseth the Latitude of the place, and consequently what height you are in.

As in this example you shall finde the point O. to bee in the fortie Degree of Latitude. And hère you are to

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note

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A brife rule
concerning
the finding
out of the la-
titude.

note that if the place assigned bee in any parallell of east and West, then is your labour saued, for the parallell it selfe directeth you to the Latitude.

P. I perceave your meaning well: and me thinketh I could frame a short rule vnto my selfe wherby to finde the latitude in this manner. If from the place assigned to the scale of latitude there be a right line drawn parallel to the Rhombe of east and west, the degree of the scale vpon which the said parallell lighteth expresteth the Latitude sought for: as you may perceave by the line O.G. which cutting the scale of Latitude in the 40 Degree, expresteth the latitude of O.

M. Your rule is good: And here you are to note, that when you search the latitude of any small pland in the Carde you must take your measure from the middelt thereof.

P. In searching out the Latitude of many places, there is one thing that troubleth me, because I know not what to saye certainly. When my compasses light preciselie vpon the beginning or ende of a Degree, then can I tell the iust latitude of the place, because the seuerall numbers adioyned expresse the same: But if the Compasses fall betwene the beginning and ending of a Degree, what shall I then saye?

A proposition.
How manie
minutes are
contained in
each part of a
degree.

M. If the foote of your compasses falleth iust in the middelt of a degree, there are 30 minutes to be added to the number of the whole degrees: if it falleth on the 4 part you must adde 15 minutes: if on the third part, you must adde 20 minutes.

P. I graunt that also, but considering that this card yea & very few others haue such subdivisions into quarters or terces of a degree, I pray you giue me some generall rule whereby I may know what minutes are answerable vnto any part of a degree contained betwene the beginning of the saide Degree, and any pizicke made
at

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at all aduentures within it.

M. If you doe remember it, I deliuered vnto you such a conclusion in that booke which I wzought concerning the vse of both the Globes terrestriall and celestiaall. The selfe same rule which I did there wzite touching the Degrees of a circle either of the Globe quadzant, or astro-labe, may be hère applied to a right line deuided into degrees. Therefore when as the foote of your Compasles lighteth betwène the beginning and ending of any Degree, and you are desirous to know what number of minutes that part of the degree may containe which is betwène the beginning of it and the foote of your compasles, you shall satisfie your selfe in this manner. Take the portion of the degree assigned, and beginning at the neithermost degree of the carde, count it from thence vntill you haue reckened it 60 times noting well, where you make an ende, for the number of the whole degrees comprehended betwène the degree where at you first began, and the point wherein you ended, expresse the number of minutes contained in the portion of the degree propounded. Otherwise to auoide y^e tediousnesse of turning the compasles ouer so many times, you may doe thus: count the said portion of the degree 5. times ouer, noting well wher your compasles lighted at the first time, from thence extend y^e foote of your compasles vnto y^e degree where at you began, & from y^e degree count the saide distance 12 times ouer, noting well wher your compasles lighteth at the 12 time, for (as I said before) the number of the whole degrees comprised betwène y^e degree wherat you first began & the point wherein you ended expresse the number of minutes contained in the portion of the degree propounded. Now if it shall so fall out at any time, that the portion of the Degree betwène the beginning of it and the foote of your Compasles shall be so little, that your Compasles cannot be brought close enough together to take it
(as

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as many times it falleth out by reason of the ill workmanship of the compasses) then take the portion of the degree remaining contained betwene the foote of your compasses and the end of the saide degree, count that portion as you did the other, noting how many degrees of the scale of latitude are contained betwene the place where you began, and the point wherein you ended, that number of degrees being subducted from 60 expresse how many minutes are contained in the foresaid small portion. Moreover if the number of the degrees in the scale of latitude be so few, that you cannot account the portion of the degree assigned 60 times, then count it but 30 times, & double the degrees contained betwene the beginning and the ende of your account or else count the saide portion but 15 times, and quadruple the saide degrees. So shall you also finde the minutes. As for example, if in counting the portion of the degree assigned 15 times ouer, you finde 11 degrees and a quarter to be contained betwene the place where at you beganne, and the place wherein you ended, multiplie those degrees and the quarter by 4. and you shall finde 45 minutes to be contained in the portion of the degree assigned.

P. Now tell mee this I pray you, were it not good that the degrees of latitude were greater.

M. It were good in dedde for him that is but a yong scholler in picking of his card, but other wise to an expert and cunning man it is neither here nor ther, though they were halfe so small againe: And I will teach you hereafter how you shall keepe your traueserse vpon your card though the degrees of latitude be but small, as well as if they were two inches long.

The vse of the
scale of
leagues.

P. Let vs now proceed to the scale of leagues what vse hath it?

M. The vse therfore is to finde out the distance betwene place and place: So that the conclusion to be performed

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formed thereby is this: two places being assigned to finde their distance. In working of this conclusion, this is to be noted, whether the places giuen are of lesser distance, are farther of one from an other, then the length of the scale amounteth vnto. If the two places be of lesser distance then the length of the scale (as the points I and H are) extend your compasses from the one vnto the other, and apply them afterward to the scale of leagues (beginning at the left end thereof) & you shall finde the distance of the places assigned either according to the English or Spanish account. But if the distance of the places assigned surmounteth the length of the scale of leagues, then with your compasses take either the length of the whole scale, or some certaine number of leagues, as 20. 40. 50. or 100. and lay your ruler vpon the 2 places assigned, or else with a fine black leade draw a line from the one vnto the other, afterwards beginning at either of them, count the number of leagues which you take out of your scale (keeping your compasses close by y^e rulers side) as many times as you can betwene them: Still adding the number of the leagues as you goe on. If at length the foote of your compasses lighteth iust vpon the other place assigned, then doth the totall summe of the leagues added together expresse the distance of the 2 places. But if in setting the foote of the compasses forward, you finde that it falleth beyond the place propounded, then bearing in mynde the totall summe of the leagues all ready reckoned, and pulling in the foote of the compasses vntill it touch the place assigned, & applying them vnto y^e scale of leagues, you must adde the leagues contained betwene their seete, vnto the summe found out before and noted in your minde, for the totall number expreth the distance of the places assigned. As for example, desiring to finde the distance between I and R. I take out of the scale 50 leagues, and counting the said by y^e edge of my ruler 4 times, which make 200.

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leagues

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leagues & turning the foote of my compalles the first time toward y place assigned, I finde that it ouer reacheth the place: wherfoze bearing in minde y former 200. leagues, I pulled in my cōpalles vntill the foote touched the place assigned, and applying them vnto the scale, I found 87. leagues to be contained betwene their feete, which being added vnto the other 200, declare the distaunce of the 2 places to bee 287 leagues according to the English account.

P. In good time were those words mentioned, for looking vpon the scale of leagues I found on the vpper part thereof these wordes English leagues, and vnder it Spanish leagues: what meanes these wordes.

M. They are there set to signifie the difference betwene vs & the Spaniards in counting of distances. We attribute vnto euerie degree on earth (that is vnto the 360. part of the Compasse of the earth) 20 leagues, each league containing 3 miles, so that we make y whole compasse of the earth to bee 7200 leagues, or 21600 miles. The Spaniardes hauing their miles longer then oures, attribute vnto each Degree but 17 leagues and a halfe, so that by their account the circuite of the earth is 6300 Leagues, and one of their miles is vnto one of our sesquiseptima, that is as 8. is to 7. and seauenty, of their Leagues make eightie of ours. Wher vpon you shall note this, that many times 2 places are said to bee of a diuers distaunce one from an other, yet are the places set where they ought to bee, and there is no error in the Carde, but the difference ariseth vpon the account diuerselie made betwene vs and the Spaniards. As for example from Cape Finister vnto Po. Santo according to the Spanish account are 200 leagues, but according to our account it is more by 24. wherfoze in pricking of your Carde you must haue a deligent eye to your scale, least in mistaking the one kind of Leagues for the other, you mis

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misreken your selfe and finde fault with your Carde where there is none. Is there any thing else which you would craue concerning the scale?

P. Yea, I haue a question or 2. to be asked. If there be no scale in my Carde what shift shall I vse to make one?

M. I tolde you euen now that euerie Degrée according to the English account is twentie Leagues, therefore five Degrées are one hundred leagues, and 2, Degrées and a halfe are fiftie Leagues, so that if you take five degrées of the scale of Latitude, and diuide them into 10 partes, each portion shalbe 10 Leagues, and each of them diuided into 5 partes, are 2 Leagues. But if you diuided the 5 Degrées into 8. partes then is each parte 12 leagues and $\frac{1}{2}$. The Spanish scale is thus made, 80 English leagues as I said before, are but 70 Spanish, therefore if you take foure degrées of Latitude & diuide them into 7 pièces each portion is 10 Spanish leagues.

P. I perceaue that I may make my scale of Leagues by the degrées of Latitude. I pray you therefore contrariwise tell mee, when the Carde hath no degrées of Latitude, but a scale of leagues, how shall I finde out the length of the Degrées of latitude wherby the carde was made?

M. The quantitie of each degré of Latitude is easely found out by the English leagues, because 100 English make iust 5. degrées: but if the leagues be Spanish, you must diligently note this, whether the greater diuisions of the Scale containe seuerally 10 leagues or 12 & $\frac{1}{2}$. If they containe 10 Leagues a pièce, seauen of them diuided in 4. partes make 4. degrées, but if the foresaide partes bee each of them twelue Leagues and $\frac{1}{2}$. then take seauē of them which amount vnto eightie 7. leagues and $\frac{1}{2}$. & diuide them into 5. pièces which make 5. degrées

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of

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of Latitude euery one contayning seauentéene leagues and $\frac{1}{2}$.

P. The third thing which I stand in doubt of is this : when the Card hath neither Degreës of Latitude nor scale how I shall make them both.

M. This cannot be done vnlesse y the distaunce betwéene some 2 places in the card be certainly knowen, and then it may be gathered out of that which hath bene said before, especially if the two places assigned lie North and south one from an other. As for example, if I know that the distaunce betwéene cape Vincent and the rocke is 40 English leagues or 2 degreës of Latitude, I may out of that distaunce easely gather the quantitie of my scale of Leagues and degreës.

P. Let vs now procéde : Hether to we haue spoken of the Rhombes, of the scale of Latitude, and the Scale of leagues, as they were to be considered seuerally eache one by it selfe, what is to be considered in them beeing ioyntly vled and lincked one with an other.

5 Propo.

M. There arise out of them beeing ioyned rogeather, many conclusions : As first of all this. The Rhombe being giuen and the Latitude with which you fall to finde the distaunce or the way which the ship hath made from any place assigned. The performance of the which proposition may thus briefly be deliuered. If from the place assigned there be a right line drawn parallell to the Rhombe assigned, and from the degreë of latitude there be an other line drawn equidistant to the Rhombe of east and West, cutting the foresaide line in some certaine place. The length of the right line contained betwéene y point of the interfection where the cutte is made, and the place of your departure beeing applyed to the Scale of leagues expresseth the distaunce or the way which the shippe hath made.

As

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As for example. I suppose that from the point N. I went South and by East 3 quarters of a point more to the Eastward untill I sette with the 40 degree of latitude. Therefore (by the second proposition of this booke) from N. I draw a line parallel to the Rhombe of South and by East, &c. and from the 40 degree of latitude, I draw an other line parallel to the Rhombe of East & West, the 2 lines drawn concur and meete in the point O. the length of the line N. O. applyed to the scale expresseth the distance to bee 75. leagues. An other conclusion is this: ^{6 Propo:} The distance or way which the shippe hath made being giuen and the Rhombe to finde in what latitude you are. The proposition is thus performed. If in the right line drawn from the place assigned parallel to the Rhombe giuen, bee limited according to the scale of leagues, the distance or way which the shippe hath made, the right line drawn from the ende of the said distance parallel to the Rhombe of East and West shall cutte off in the scale of Degrees the latitude sought for. As for example from N. I went South & by East 3 quarters of a point more to the Eastward seauenty five leagues, I demande with what Latitude I fell. From N. I draw a line parallel to the Rhombe of South & by East, &c. (by the position) in the which line I account the distance that is seauenty five leagues from N. to O. then from O. I draw a right line parallel to the line of East and West, which cutteth the scale of latitude in the fortie degree which is the degree sought for.

7 Propo:

The third conclusion is this. The distance being giuen and the Latitude to finde the Rhombe, Your rule is this: If from the Latitude giuen towarde the place assigned there bee a right line drawn parallel to the Rhombe of East and West, and on the place assigned being the center ther be a circumference described, hauing for his Semidiameter the distance giuen, and

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cut.

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cutting the foresaid parallell at all adventures in a point on that side of the meridian on which your course doth lie the right line drawn from the place assigned to the sayd point where in the section was made, shall expresse the Rhombe desired. As in this example. Suppose that going from N. 75 leagues, I found my selfe to be in fortye degrees of latitude, I would know upon what Rhombe my course was made.

From the 40 degree of Latitude, I draw a line O G. parallell to the Rhombe of East and West. Then with my compasses I take out of the scale 75 leagues, and setting the one foote of them in N. (that is in the place assigned from whence I departed) with the other foote on the right side of the Meridian, because my course lyeth Easterly, I make a circumference, cutting the line O G. in the point O. I draw a right line from N. to O. which by the first proposition I finde to be the Rhombe of South East and three quarters of a point more into the Eastward, upon which I made my course.

P. In making of the circumference mentioned in your rule, why doe you bidde mee cut the Parallell on that side of the meridian on which my course doth lye?

M. Because the Parallell lyne which is drawn from the scale of Latitude may be cutte as well on the East as on the West side of the Meridian from whence you depart, and therefore in answering to the former proposition, there is a secrete consideration to be had with your selfe, which way your course doth lie, whether to the right or left hand of the Meridian, the which consideration being had, and the compasses being guided accordingly, wee may easely finde out the Rhombe.

P. These three conclusions mee thinketh should be not onely pleasaunt, but also very commodious for the saylor, because by either of them hee may easely and readily finde the place wherein hee is, (which as I remember

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ber they called in the pricking of the Card : for the point wherein the Rhombe assigned, and the Latitude : or the assigned Rhombe, and the distance or the assigned Latitude & the distance doe concurre expresse the place wherein hee is.

M. You say true Philomathes, and for so much as there are three things whereby the sea-faring man may helpe him selfe by meanes of his card, that is his Latitude, his distance or way which his ship maketh, & the Rhombe vpon which hee shapeth his course, hereby he may assure him selfe two of them being giuen (namely the Rhombe, and the Latitude, or the Rhombe and the distance, or the Latitude and the distance whether he hath erred in the other yea or no, and how much hee hath erred. As for example : If in sayling from N. to O. South and by East three quarters of a point more into the Eastward, and finding my selfe to be in the 40 degree of Latitude, I shall affirme that I haue runne 75 Leagues, by the first of these three conclusions which is the fifth proposition, I shall certifie my selfe whether I kept the reckoning of my way true, yea or no, for my compasses being extended to that number of leagues, and the one foote of them being set in N. if the other foote reacheth iust vnto the point O. wherein the Rhombe and the Latitude are supposed to concurre, I may assure my selfe that my distance was truly obserued. But if the foote of the compasses shall fall either short of, or beyond the point O. then haue I erred in obseruing the way of the Shippe, and the distance betwene the foote of the compasses and the point O. being applied to the scale of leagues, expresseth the quantitie of myne error. Secondly, if by the diligence of mine obseruation I can assure my selfe that I haue run South & by east, 3 quarters of a point more to the eastward 75 leagues, and at length obseruing the Sunne or Starre, shall auouch y I am in the 40 degree of latitude :
then

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then picking out my course vpon that Rhombe from N to O. if that the right line drawne from the 40 degree of latitude parallel to the Rhombe of East and West, doth not precisely concurre in the point O. but falleth either above or beneath it, then haue I erred in taking my latitude, and the quantitie of myne error is betwaxed by the shortest line drawen from the point O. to y^e said parallel. In like manner if by my obseruation precisely made, I can warrant my selfe of my distance & of my latitude, & shall auouch, that from the point N. I went South & by East 3 quarters of a point more to the eastward. If from y^e point N. I draw such a Rhombe (by the 2 proposition) & it shall not concurre in the point O. wherein the latitude and the distance doe concurre, then may I say that I haue erred in the Rhombe, and the quantitie of myne error is to bee found by the arcke of y^e circumference contained betwixt the point O. and the Rhombe drawen.

P. I perceauie that these things doe follow, and are conveniently inferred out of y^e three former conclusions, but may they be taken as certaine and trewe?

M. Oh Philomathes, you know I told you befoze that the plaine card was not in all points correspondēt to the dimensions of the Globe, & therefore there cannot a most exquisite and a precise truth be warranted thereby, but for so much as the common marriner (the more is the pite) hath no better help, I teach him & you how to make a benefit and a pleasure vnto him selfe, of that which hee hath, so farre forth as the thing it selfe will permit him. Let vs now procede. This also may bee perfozmed vpon the card: Two places vpon the shoare being knowen, & the point of the compasse vpon which they beare from you, to finde how farre distant you are from the shoare, in a direct course, or from either of the two places.

P. But is it not materiall whether I bee thwart of the one of the two places yea or no?

M. It

The eight proposition.

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M. It maketh no matter : let them lie from you how soeuer, so that you & the two places be not in a right line. Your rule is this. If from the 2 places assigned there bee Rhombes drawen opposite to the 2 Rhombes vpon which the 2 places doe beare : the distance betwene the concur of those two Rhombes and the shoare, or the places assigned, will expresse how far of you are from either of them, or from the shoare it selfe.

P. What meane you by the two Rhombes which are to bee drawen opposite vnto the Rhombe vpon which the two places doe beare.

M. This is my meaning, that if the one place doth lie East and by North, you should draw a Rhombe from it west and by South, and if the other place lie East south east, you should draw a Rhombe from it west north west. For allwaies the concurrence of the opposite Rhombes will expresse y^e place wherin you are, which being once known, you may by the scale of leagues easely gather how farre you are distant from any place. Moreover vpon the carde this may be performed : the Rhombe & the distance being giuen to finde how wee haue rayled and let fall the Pole. For if in y^e Rhombe assigned (as for example) in the line N O. wee count the distance vnto the point O. from the point N. y^e parallels drawen east & west from the points N. & O. shall in y^e scale of latitude comprehend betwen the the degrees which we haue shifted in y^e height of y^e Pole.

The ninth Proposition.

P. Now that you haue made mention of rayling the Pole, I pray you tell mee, may not this conclusion bee wrought vpon the card, in rayling or letting the Pole fall a degree to finde how many leagues wee runne vpon any Rhombe assigned?

The tenth Proposition.

M. Yes that you may Philomathes, & that so much y^e better in that the question is but of one degree, for in many degrees the error would appeare, as may be gathered by y^e which hath bene said heretofore concerning y^e projection of

C.

this

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this card. And forsomuch as each seuerall degré of this carde is somewhat to litle wherby to work this conclusi-
on conueniently, therefore suppose that 5 degrés of your
card were but as one, then must each degré be 4 leagues,
and half a degré must be 2 leagues. This being supposed,
make choise of some one center of a flie within your card,
as for example, I chouse the center D wherein the Rhombes
doe concur on the left hand of the card: aboue that center
from the point F which is distant from D the length of
5 degrés counted notwithstanding but as one, I draw a
right line parallell to the Rhombe of east & west, cutting
the Rhombes proceeding from the point D. in the points
A.B.C.D.E.F.G. Then making the line DF your scale,
(the which because it is supposed to be a degré, it must of
necessitie be accounted for 20 leagues, if you measure ther
with the lines Da.Db.Dc.Dd. De.Df.Dg. you shall easi-
ly finde how many leagues you run vpon any Rhombe, in
rayling, or letting the Pole fall a degré.

11 Propo:

P. Out of this mee thinketh also that I may inferre
an other conclusion which is this: The pole being raised
or let fall a degré to finde how far I am distant from my
meridian running vpon any Rhombe assigned.

M. You say trew: for if by the said 5 degrés taken
but for one, being in quantitie 20 leagues, you measure
the distance betwene the points F and a. P and b. P and
c. &c. you shall finde the distaunce betwene the meridian &
each seuerall Rhombe. These conclusions Philomathes, as
foresaid, being noted diligently, it followeth now to teach
you that, which is the summe of them all, wherein they
must all iointly concurre together, the which conclusion
is this: How to keepe your trauesie vpon the card. The
which proposition though it bee in wordes differing from
the rest, yet is there nothing in it, which hath not bene se-
uerally deliuered in the former propositions, so that it re-
quireth onely a dexteritie in practising, and working that
which

12 Propo:

which you haue learned, as shal appeare in this example. Suppose that I were to go from H. to Saint Maries Iland, the which 2 places as it may appeare by the 1 proposition doe beare one from an other south west & by south two thirdes of a point more vnto the westward, and by the 4 proposition I finde them to bee 332 leagues a sonder, but making my course vppon the foresaid Rhombe, I was no sooner from y^e shoare, but I was carried first with an easterly winde 100 leagues to the westward. Secondly, I was carried from thence to the South east a quarter of a point more to the eastward 90 Leagues. Thirdly, the winde comming about, I was carried south south west 72 Leagues. Fourthly, I was driuen by tempest south & by east three quarters of a point more vnto the eastward I know not how farre, but I found my selfe to be in the 40 degree of Latitude. Fifthly I was from thence enforced west and by South 60 leagues. Sixtly, I was with a contrary winde put North northeast 40 Leagues. Seuenthly, I ranne 160 Leagues I know not vppon what Rhombe certainly, but it was to Westwarde of the meridian, vntill I shifted my Pole foure degrees and a quarter. I demaund in what place I might bee, and what Rhombe it was vpon which I ranne last. 2. What Rhombe I should haue kept to the place wherein I finde my selfe to bee if I had not founde the winde contrarie. 3. how many leagues I am from the place of my departure. 4. how I haue shifted the Pole. 5. How farre I am from my Meridian. 6. How many Leagues I haue to R. 7. What Rhombe will set my course thether.

P. If it please you sir I will see how I can ans were the question.

M. Doe so, it will be good for you alwaies to practize that which you know.

P. First by the fourth proposition from H. westwarde I count 100 leagues to the point I. Secondly by the 2

C.ii.

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proposition I drawe the Rhombe of South East a quarter of a point more to the Eastward, from the point L and in it from the saide point I. count 90 Leagues to the point M. Thirde by the second proposition from the point M. I draw the Rhombe of South south West, and count therein seauentie 2 leagues from M to N. Fourthly by the 6 proposition I finde my selfe to be in the point O. which is in the fortie degree of latitude & 75. leagues from the point N. Fiftlie by the 2 and 4. propositions I finde my selfe to be in the point P. that is west and by South sixtie leagues from O. Sixtie by the forenamed propositions, I finde my selfe to be in Q. which is North Northeast 40 leagues from P. Last of all by the seauenth proposition, I answere that I finde my selfe to haue kept my course Southwest and by West, and to be at the point R. Secondly if I had not bene molested with contrarie windes, I might haue runne Southwest and by South halfe a point more to the Westwarde. Thirde I am three hundredeth thirtie 2 leagues from H. Fourthly I haue shifted the Pole 13. Degrees $\frac{1}{4}$. Fiftlie I am from the Meridian of H. according to this proiection of the Carde two hundredeth 14. leagues. Sixtie I haue vnto the Island of S. Maries, about 12 Leagues, and I must set my course thether westerlie.

M. You haue answered the question Philomathes directly: Where might we make an end of the vse of the Sea Card, were it not that I remember you propounded vnto mee a question heretofore concerning the degrees of Latitude: whether it were not better for the Marriners vse, if they were greater then they be vpon this Carde: I must confesse, that generally all instruments mathematicall to be vsed either by land or sea, are so much y more comendable by how much the more they excēde in quantitie: but touching the plaine sea Carde though it be but of a verie small picke, yet may it be vsed as if it were

2.4.02 8. times so great againe as it is. For as for the Rhombe they serue our vse in a small Carde as well as in a greater, and that so much the better by how much they come the nearer together, so that the compasses need not so large an extention on the small Cardes as they require vpon those which are of a larger pꝛicke. As for the smallnesse of the degrees of Latitude, they may be remedied by supposing 2. 4. 02 8. degrees to bee but as one, and so likewise may the leagues be taken twentie for 10 02 for five, and one hundredeth may bee supposed to bee but fiftie 02 25. according as you alter the proposition of the degrees of Latitude.

P. I pray you make this thing plaine vnto me, I doe partly perceiue your meaning by your former wordes but, I would haue the matter laid open moze manifestly.

M. When as the degrees of Latitude in your carde, and the leagues of the scale doe seeme to be too little for your vse. First of all seeke out in it by the first proposition, the Rhombe vpon the place whether you goe, beareth from the place of your departure, seeke out also the Latitude of the place from whence you depart. Then suppose so many degrees of Latitude in your Carde (as you thinke good) to bee but one, (for example sake suppose 4. of them to be but one, so that eache seuerall Degree by this supposition is but a quarter, & each halfe degree is but halfe a quarter: and consequentlie in the scale of leagues 80 degrees are but 20, and twentie are but five, and the small space betwene the pꝛickes is but halfe a League) according to this supposition you must pꝛicke your carde and keepe your trauerse.

P. That I know, but when as I haue kept my trauerse according to that supposition, how shall I reduce the place, wherein I finde my selfe to be by my trauerse, vnto my owne Carde, that my card being neuer so little I may say that this, 02 this is the place wherin I am. As

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for example, if I were to go from cape S. Vincent to Porto Santo, my course lyeth southwest & by west. And this I perceiue y if I should suppose euerie 4. degrees of this card to be but as one, I must suppose Porto Santo to lie from cape S. Vincent. 4. times so farre as it doth. Now say that I ranne from cape S. Vincent west south west 60 leagues then by y former supposition I must needes be in y point Z. which in the carde is beyond Porto Santo a great deale to the Westwarde, whereas I should bee betwene cape S. Vincent & Porto Santo, therefore I pray you tell mee how in my carde I may make a picke representing the true place wherein I am.

M. This thing Philomathes is most easely done if you marke the proportion of your supposition. You suppose 4 degrees to be but as one, therefore the point Z. is 4. times so far from cape S. Vincent as it should bee, so that if you diuide the length of the line betwene the cape and the point Z. into 4 parts, the fourth part is the true distaunce from the cape. In like maner if you wold know the latitude, wherein you are according to your Carde it selfe, deuide those Degrees of Latitude which are contained betwene the Latitude of cape S. Vincent and the Latitude of the point Z. into foure equall parts, for the fourth parte giueth the Latitude wherein you are.

This thing Philomathes is worth the obseruing, for by this meanes you shall bee able to vse your Carde of what quantitie soeuer it is.

P. I doe now vnderstand better then I did befoze, and I obserue this as a generall rule, that I must alwaies follow the proportion of my supposition in finding out either the true Latitude or the true distaunce: for as touching the Rhombe that kepeth still his denomination. So that if I should suppose two Degrees of my Carde to bee but as one, then must I take halfe

halfe the supposed distaunce for the true distaunce : and if I suppose 8 Degrées to bee but one, I must take the 8 part of the supposed distaunce to bee the true distaunce, and in like manner must I doe in finding the true Latitude.

M. You saye well Philomathes. And here you are to note that you may suppose the place of your departure to bee in anie place of your Carde where you thinke most conuenient to keepe your trauerse (or if you will you may keepe your trauerse vpon some blanke skinne which hath nothing in it but the lines) imagining the degrées to be as great as you please, and afterward you may applie it to your Carde by the vertue of the first proposition, which teacheth you the Rhombe being giuen and the distaunce to finde the true Latitude, and consequentlie the place wherein you are, the saide Rhombe being drawn, and the distaunce accounted in your carde from that place, from the which you departed. Moreover if it shall so fall out, that beyond the Ilands or other coast of the land sette downe in your carde, there bee not scope enough for you to trauell, either East, West, North, or South, (as for example in this your carde there is not space enough to trauell either from the Terceras westward, or from the Canaries southward) you may by the former rule suppose anie place in your carde to be the place wherein you are, and afterwarde keepe your trauerse at your pleasure.

Thus much briefely Philomathes concerning the vse of this plaine carde, wherein if I haue satisfied you to your contentment, I shall bee glad, but this I could wish, that you should not alwaies addict your selfe vnto this kinde of plat, but laboure & strue to bee cunning in anie other, that are extant, that comparing the one with the other, you may make choise at the length of the best, though

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though in y meane season you vse this as an help in your trauell. And thus: &c.

P. Now stay a while sir I pray you, there is yet one thing to be spoken of, which are the cyphers sette rounde about the two flies, whereof the one is at the bottome, the other at the toppe of the carde, I would faine know to what purpose they are.

M. You remember that in the tenth proposition, we spake of the Leagues, which we runne vpon euerie point of the compasses in rayling, or laying the Pole a degree, these Leagues are expresse in the vppermost halfe of that circle which incompasseth the great flie at the bottome of the carde, from A to B and from B to C and are adioyned to eache Rhombe, or point of the compasse, whereof those, which are on the quarter A B are the English, the other on the quarter B C are the Spanish Leagues.

Moreouer in the eleuenth proposition, we spake of the distaunce from the Meridian in rayling the Pole or letting it fall a degree sayling vpon any Rhombe assigned. Those Leagues, both English and Spanish, are likewise expresse vpon the nether halfe of the circle, that they might be ready for those which are desirous to know them vpon a suddaine without the vse of the compasse. The other cyphers, which are sette about the flie at the toppe of the carde, serue for the finding out of the height of the Pole by the north or Pole starre, according as it is pointed with the guardes: So that by the placing of the foresaide figures you are to note this that the former guardes being in the East, the North starre is one degree and an halfe vnder the Pole, and therefore you must adde so much (for so the letter A doeth signifie) to the height of the starre, that therby you may finde the true height of the Pole.

Item, the guardes in the West the starre is one degree,

grée and an halfe, aboue the Pole, and therefore you must subduct so much (foz so the letter S. doth signifie, from the height of the starre to finde the height of the Pole. In like manner you are to addē or subduct the numbers set vpon the other points of the compasse vnto or from the height of the North starre according as the letters A. and S. doe direct you. These things Philomathes, the sailors by their long experience, haue noted to bee auailable for their vse, and therefore they haue thought it good to put them into their cards, the which things you may apply also to your comoditie as occasion serueth, hauing the meaning thereof laide open vnto you. Hereafter if it shall please you to repaire vnto my lodging being a little from the Minorites toward the Towar, you shall not onely haue the cardes ready to serue your turne for all places to which there is any traficque vsed, but I will bee readie to farther you in any other Mathematicall conceit, to the vttermoſt of my power.

P. I know it well, and haue had much experience of your good will, and therefore I thank you, and I acknowledge my selfe a debitor for the same. But befoze wee part, I pray you let mee haue your opinion in this: what thinck you of Mercators card: and wherein differeth it from the plaine card?

M. Philomathes, I iudge it to be an excellent work in respect of the proiection thereof, and might (by inlarging of it) bee made most fitte and conuenient for the saylours vse: it differeth from the common carde in this, that the degrées of Latitude are not equall but ware greater & greater toward the pole, wherby ther ariseth a double commoditie, for by this meanes the land is not so distracted as it is vpon Plancius his Mappe, who followeth the proiection of the plaine Carde, & it cometh verie neare vnto the Symmetrie of the globe, because the degrées of Latitude are so proiected, that each one of

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them may be the scale to measure iustlie the circumference of that parallell which runneth through the ende of the said degree, so that you may trulie measure the distance betweene east and west, and it is therefore the best Carde, that euer I saw extant, whereon you may keepe an account of your longitude. In the vse of it the degrees of the equinoctiall are the common scale to measure anie distance assigned, and your reckening, must be kept, not vpon the Rhombe vpon which your course lyeth, but vpon that Rhombe, which is so farre distant from the equator, or parallell of east and west, as the Rhombe, vpon which you made, your course was distant from the Meridian. Thus much Philomathes concerning that matter, I feare my speach seemeth darcke vnto you, and my leasure will not now serue mee to shew you the booke, which I haue written concerning the vse of Mercators Carde. Hereafter when more leasure shall serue I will be readie to let you haue the sight of it.

P. I thanke you, in the meane time I bidde you farewell.

FINIS.



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